Docket No. YOR9-2000-0571-US2

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IFW

In re application of: Richard A. HAIGHT et al.
Serial No.: 10/698,884
Filed: October 31, 2003
For: *METHOD AND APPARATUS FOR PERFORMING LASER CVD*

Mail Stop Appeal Brief- Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith, in triplicate, is Appellants' Brief in support of its appeal to the Board of Patent Appeals and Interferences from the decision dated March 29, 2005, of the Examiner finally rejecting claims 1-25 of the above-referenced application.

[ ] A petition for extension of time is enclosed.

[X] The Commissioner is hereby authorized to charge payment in the amount of $ 500.00 to cover the filing fee to Deposit Account No. 50-0510.

[X] The Commissioner is hereby authorized to charge payment of any necessary fees associated with this communication, or credit any overpayment, to Deposit Account No. 50-0510.

Respectfully submitted,

Date: September 6, 2005

By: _____
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JEFFREY N. GIUNTA — Name
Signature
September 6, 2005 — Date

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
Richard A. HAIGHT, et al.)
Serial No.: 10/698,884)
Group Art Unit: 1762)
Filed: October 31, 2003)
Examiner: M. Padgett)
For: METHOD AND APPARATUS)
FOR PERFORMING LASER CVD)

APPELLANTS' BRIEF UNDER 37 C.F.R. §1.192

MS – APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appellants' Brief is filed in response to a Final Office Action dated March 29, 2005 and a Notice of Appeal received July 5, 2005. This Appellants' Brief is being timely filed on Tuesday, September 6, 2005, the first business day after Labor Day, September 5, 2005. Reconsideration of the Application, withdrawal of the rejections and allowance of the claims are respectfully requested.

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ON: Sept. 5, 2005 BY: JEFFREY N. GIUNTA

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I. REAL PARTY IN INTEREST

The real party in interest is International Business Machines (IBM) of Armonk, NY.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1-25 are pending. Claims 1-25 are identified as rejected in the Office Action Summary, but the Examiner gives no grounds, basis or remarks concerning claims 15-19.

The Examiner's rejection of claims 1-25 is on appeal.

Attached hereto is an Appendix containing a copy of claims 1-25, which include the claims involved in this appeal.

IV. STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection of March 29, 2005.

V. SUMMARY OF THE INVENTION

Preferred embodiments of the present invention provide a method and system for depositing material, such as metals, onto a substrate. Specification, Abstract. A substrate is placed on a stage and a mixture of carrier gas and donor compound vapor are caused to flow over the substrate. Specification, Page 13, lines 22-25. The flow is adjusted to obtain a laminar flow over the substrate. Page 13, lines 25-26. This laminar flow of gas results in a few monolayer thick film of donor molecules being maintained on the substrate. Specification, Page 14, lines 3-4. A high intensity optical radiation source irradiates the donor compound on the substrate and causes a film of the element born by the donor compound to be deposited on the substrate. Specification, Page 14, lines 7-10. The optical radiation source is able to produce photons at a wavelength at which

the donor compounded has insufficient cross section to yield significant decomposition in conventional processes, or to produce photons which have insufficient energy quanta to cause decomposition of the donor compound, but produces these photons at a sufficient instantaneous intensity to initiate decomposition of the donor composition by a nonlinear two photo absorption process. Specification, Page 14, line 24 through page 15, line 5. The optical radiation source is operated at wavelengths where the donor molecule has sufficiently small absorption cross section to avoid significant photolytic break down of donor molecules in the carrier gas above the substrate, thereby causing the breakdown of donor molecules on the substrate. Specification, Page 15, lines 11-17. The optical radiation is produced with pulse widths that create unwanted thermal effects. Specification, Page 19, lines 16-19. These unwanted thermal effects include uncontrolled lateral spreading of the deposit. Specification, Page 19, lines 6-7. Instantaneous intensities of the optical radiation are preferably at least about 50 gigawatts/cm^2. Specification, Page 21, lines 1-4.

VI. ISSUES

Whether claims 1-6, 8-14, and 20-22 are unpatentable over *Polanyi et al* (U. S. Patent No. 6,314,566) in view of *Morishige* (U.S. Patent No. 4,711,790) under 35 U.S.C. §103(a).

Whether claims 23-25 are unpatentable over *Polanyi et al* (U. S. Patent No. 6,314,566) in view of *Morishige* (U.S. Patent No. 4,711,790) and further in view of *Trushin et al.* ("Femtosecond Dynamics...") under 35 U.S.C. §103(a).

VII. GROUPING OF CLAIMS

Group I: Claims 1-8, 11-14, 18-19, 21-22 stand or fall together.

Group II: Claims 23-25, and 14 stand or fall together.

Group III: Claim 9 stands or falls alone.

Group IV: Claim 10 stands or falls alone.

Group V: Claim 15 stands or falls alone.

Group VI: Claim 16 stands or falls alone.

Group VII: Claim 17 and 20 stand or fall together.

VIII. ARGUMENT

A. WHETHER CLAIMS 1-6, 8-14, and 20-22 ARE UNPATENTABLE OVER *POLANYI* ET *AL.* IN VIEW OF *MORISHIGE ET AL.*

In the Examiner's Final Office Action of March 29, 2005, the Examiner rejected claims 1-6, 8-14, and 20-22 under 35 U.S.C. § 103(a) as being unpatentable over *Polanyi et al.* (U. S. Patent No. 6,319,566) (Hereinafter *Polanyi*) in view of *Morishige* (U. S. Patent No. 4,711,790) (Hereinafter *Morishige*). Although the Examiner's Final Office Action states the rejection includes claims 20-11, the Examiner's previous office action, dated July 29, 2004, which is referred to in the final office action, rejected claims 20-22 on the same grounds. The Appellants are assuming that the Examiner's rejection includes claims 20-22 and not claims 20-11 as stated. The Appellants respectfully submit that claims 1-6, 8-14, and 20-22 are not unpatentable over *Polanyi* in view of *Morishige* under 35 U.S.C. § 103(a).

The Appellants respectfully assert that the *Polanyi* and *Morishige* references, taken either alone or in combination with one another, do not teach or suggest the claimed limitations of: "irradiating the donor compound with optical radiation having an intensity sufficient to cause deposition of the one or more elements onto the substrate through photochemical decomposition of molecules of the donor compound within the film formed on the substrate, wherein the intensity of the optical radiation is insufficient to cause significant photolytic breakdown of molecules of the donor compound that are suspended in the carrier gas." The cited prior art references also do not teach or suggest: passing the carrier gas "over the substrate at a rate that causes it to have a laminar flow over the substrate" as set forth for the presently claimed invention. Furthermore, the cited prior art references do not teach or suggest: passing the carrier gas

"over the substrate at a rate that causes formation of the film of the donor compound on the substrate so that the film is a few monolayers thick." Additionally, the cited prior art references do not teach or suggest: irradiating the donor compound with optical radiation having an intensity that "is sufficient to initiate decomposition of the donor compound by a nonlinear two photon absorption process" or that the optical radiation "has a peak intensity of at least about 50 Gigawatts per square centimeter" as is set forth for the presently claimed invention. The cited prior art references finally do not teach or suggest "flowing a carrier gas in contact with a solid donor compound to generate a mixture of donor compound vapor and carrier gas; and flowing the mixture over the substrate" as is also set forth for the presently claimed invention.

Group I: Claims 1-8, 11-14, 18-19, 21-22

The Appellants suggest selection of independent claim 1 as representative of the Group I claims. The rejection of the Group I claims in the final office action refers to section 6 of the previously issued office action that was mailed July 29, 2004. Final Office Action dated March 29, 2005, page 2, section 4, first paragraph. The Appellants will address the issues raised in both the final office action, mailed March 29, 2005, and the previously issued office action mailed July 29, 2004.

To begin, the *Polanyi* reference is directed to molecular-scale pattern imprinting at surfaces. The method of *Polanyi* places an adsorbate that is arranged into a pre-existent molecular-scale pattern on a substrate surface and then excites that adsorbate so as to induce a chemical reaction between the adsorbate and the surface. *Polanyi* at column 18, lines 2-6. The result of this reaction leaves a pattern on the surface that corresponds to the pre-existent molecular scale pattern of the adsorbate. *Polanyi* further teaches that the ordering of the adsorbate molecules to form the pre-existent molecular-scale pattern can be due to adsorbate-substrate forces or adsorbate-adsorbate interactions (so-called "SAMs"). *Polanyi* at column 7, lines 52-57.

The system taught by *Polanyi* uses Ultra High Vacuum (UHV) and states that the UHV is the reason that "gas-phase dissociation by the irradiation was negligible." *Polanyi* at column 10, lines 31-33. The Examiner asserts that such a statement in *Polanyi* "explicitly excludes photolytic decomposition of gaseous precursors occurring" and apparently is a teaching of the claimed limitation of "wherein the intensity of the optical radiation is insufficient to cause significant photolytic breakdown of molecules of the donor compound that are suspended in the carrier gas." Final Office Action dated July 29, 2004, at page 4, second paragraph. Appellants traverse this position of the Examiner.

Polanyi does not teach this claim limitation in the context of the Group I claims, especially when they are considered as a whole. The cited portion of *Polanyi* refers to an embodiment that uses UHV when irradiating the adsorbate. *Polanyi*, column 10, lines 28-33. The Appellants assert that in this embodiment of the *Polanyi* teachings, there is no carrier gas, and therefore there is no teaching this claim limitation. The Appellants point out that Claim 1 further recites "passing a carrier gas with the suspended donor compound over the substrate." Clearly, requiring a carrier gas over the substrate precludes a UHV environment.

The Examiner correctly states that *Polanyi* teaches "use of gaseous precursors to form the adsorbate film on the surface." Final Office Action dated March 29, 2005, page 2, last paragraph, citing *Polanyi*, column 3, lines 48-52. The *Polanyi* reference further teaches that the adsorbate forms on a marked pattern that are formed by "using different crystal faces or by the deliberate introduction of patterned defects" or by application of voltage or current pulses to the tip of an STM. *Polanyi*, column 4, lines 16-31. Although the *Polanyi* reference teaches deposition of the adsorbate by exposure of the surface to a gas, the *Polanyi* reference then goes on to state that the irradiation is performed in a UHV environment. *Polanyi*, Column 10, lines 28-33. Although not explicitly described by *Polanyi*, the apparent process taught by *Polanyi* requires the evacuation of the gas prior to irradiation to cause imprinting.

The Examiner states that "claim 1 only requires irradiation to be applied to the deposited film to cause photodissociation in the film." Final Office Action

dated March 29, 2005, page 2, last paragraph. The Appellants disagree with this claim construction. Claim 1 explicitly requires "passing the carrier gas with the suspended donor compound over the substrate" and requires "the intensity of the optical radiation [to be] insufficient to cause significant photolytic breakdown of molecules of the donor compound that are suspended in the carrier gas." This clearly requires that there be a carrier gas in which there is no photolytic breakdown. The *Polanyi* reference does not teach or suggest, and in fact teaches away from, a significant gaseous atmosphere of any composition, especially an atmosphere that would contain compounds that are susceptible to dissociation, during irradiation since it uses an ultra high vacuum (UHV). The UHV in *Polanyi* is required to achieve the negligible gas-phase dissociation cited by the Examiner. The Examiner is trying to apply the absence of photolytic decomposition in the *Polanyi* system, which is simply a by-product of the UHV in the completely different apparatus of the *Polanyi* reference, as a teaching or suggestion of the claimed limitations. As stated above, the Appellants assert that the teachings of the *Polanyi* reference cannot be applied in the manner asserted by the Examiner to render the Group 1 claims obvious.

The Examiner made this rejection by reducing this limitation to simply "excludes photolytic decomposition". This is improper and does not consider the limitation, let alone the claim, as a whole. In the method of *Polanyi*, there is simply no carrier gas, and therefore no donor compound can possibly be suspended therein, and thus there is no need to limit optical radiation intensity to a level that is insufficient to cause breakdown of the same. The cited aspect of *Polanyi* simply does not teach or suggest the actual claim limitation, or at the least fails to give consideration to the claim "as a whole."

The Examiner asserts that the above distinction between the *Polanyi* teachings and the presently claimed invention are simply a matter of semantics. Final Office Action dated March 29, 2005, page 3, first paragraph. The Appellants disagree. As stated above, the explicitly claimed limitations, particularly when considered as a whole, require that there be a carrier gas in which there is no photolytic breakdown. The Examiner states that this portion of the claimed

method is taught or suggested by a teaching of a Ultra High Vacuum (UHV), in which there is no dissociation because there are no molecules to dissociate. The Appellants assert that this is not a proper teaching for the limitation of "wherein the intensity of the optical radiation is insufficient to cause significant photolytic breakdown of molecules of the donor compound that are suspended in the carrier gas."

The Examiner implies that *Polanyi* teaches that dissociation "is negligible or insignificant in the gas phase." Final Office Action dated March 29, 2005, page 3, first paragraph. The Appellants assert that *Polanyi* only teaches that there is no dissociation in a vacuum – because no gas phase exists during the irradiation. *Polanyi*, column 10, lines 28-33. The Appellants assert that the positive limitations of the Group I claims, which include of having a "carrier gas" present during irradiation where no dissociation occurs, is not taught or suggested by *Polanyi*.

The Examiner continues in the final office action by asserting that "a CVD process that uses a carrier gas does not suspend its precursors (donor compounds) in the carrier gas is again a semantics argument." Final Office Action dated March 29, 2005, page 3, last third of page. The Appellants assume that the Examiner is referring to the CVD process taught by *Morishige* as the *Polanyi* reference does not address a CVD process.

The *Morishige* reference is directed to an optical CVD method that uses varying optical intensities during different phases of the deposition process. The process of *Morishige* starts by forming deposits through a photochemical reaction within the CVD vapor. *Morishige* does not teach a deposition process using a film of donor molecules or an adsorbed layer on the substrate. *Morishige* only discusses deposition from a vapor occurring by a photochemical process occurring in that CVD vapor. *Morishige* at column 7, lines 33-38. This is the exact opposite of the claim limitation of independent claim 1, which recites: "the intensity of the optical radiation is insufficient to cause significant photolytic breakdown of molecules of the donor compound that are suspended in the carrier gas."

Further, the apparatus of *Morishige* does not describe a flow rate of gas over the substrate as is recited for the Group I claims. *Morishige* only describes a flow rate through the reaction cell as a "desired flow rate known in the art." *Morishige* at column 5, lines 4-6. *Morishige* does not describe any gas flow over the substrate as part of its process. The desired flow rate is possibly set in this example to maintain a certain concentration of elements in the vapor in the reaction cell.

The Examiner states that "applicants implications that a CVD process that uses a carrier gas does not suspend its precursors (donor compounds) in the carrier is again a semantics arguments." Final Office Action dated March 29, 2005, page 3, last third of page. The Examiner further states that "the state of the donor compound as claimed is unspecified." *Id.* The Appellants assume this is a reference to an argument that the teachings of *Morishige* teach photochemical reactions within the CVD vapor. *Morishige*, column 4, lines 58-60. The Appellants assert this is equivalent to causing photolytic breakdown in the carrier gas of the invention set forth by the Group I claims. As such, the Morishige reference clearly teaches away from the Group I claim limitation of "wherein the intensity of the optical radiation is insufficient to cause significant photolytic breakdown of molecules of the donor compound that are suspended in the carrier gas." The Appellants further assert that the state of the donor compound that is being dissociated is clearly set forth in the Group I claims, as "form[ing] a film of the donor compound on the substrate."

Furthermore, neither *Polanyi* nor *Morishige* discusses passing any type of gas over a substrate so as to form a film of the donor compound. In addition to lacking a teaching of this limitation of the Group I claims, the lack of such a teaching certainly precludes any teaching or suggestion to select a radiation intensity that simultaneously satisfies the combination of: a) causing deposition onto the substrate through photochemical decomposition of molecules within the film formed on the substrate without b) causing significant photolytic breakdown of molecules that are suspended in the carrier gas, as is recited in claim 1.

The Appellants respectfully assert that neither the *Polanyi* nor the *Morishige* references, taken either alone or in combination with any other cited reference, teach or suggest the following combination of claimed limitations, as are included in the Group I claims.

> providing a donor compound suspended in a carrier gas, the donor compound including the one or more elements for deposition;
> passing the carrier gas with the suspended donor compound over the substrate so as to form a film of the donor compound on the substrate

Further, Appellants respectfully assert that *Polanyi's* teaching of the use of UHV and requirement for an ordered adsorbate make it improper to combine *Polanyi* with *Morishige*. *Morishige* only discusses the use of a CVD vapor in which a photochemical reaction occurs. There is no suggestion in any cited reference to combine the clearly disparate characteristics of the CVD vapor of *Morishige* and the pre-deposited, ordered adsorbate that is irradiated in an Ultra High Vacuum (UHV) environment, as required by *Polanyi*. Additionally, it is improper to use the Appellants' own specification for the hindsight reconstruction of the claimed invention. The Federal Circuit has repeatedly warned against using the Appellants' disclosure as a blueprint to reconstruct the claimed invention out of isolated teachings of the prior art. See MPEP §2143; *Grain Processing Corp. v. American Maize-Products*, 840 F.2d 902, 907, 5 USPQ2d 1788, 1792 (Fed. Cir. 1988); *In re Fitch*, 972 F.2d 160, 12 USPQ2d 1780, 1783-84 (Fed. Cir. 1992).

Furthermore, the adaptation of the *Polanyi* reference, which uses pre-existent patterns in an ordered adsorbate to imprint that pattern onto the surface, for use in an embodiment of the present invention, which includes passing the carrier gas with the suspended donor compound over the substrate so as to form a film of the donor compound on the substrate, destroys the intent, purpose and function of the Polanyi reference. The Federal Circuit has consistently held that when a §103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, such as proposed modification is not proper and the prima facie case of obviousness can

not be properly made. See *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

The Examiner states that "the applicants have provide no convincing reasons why the use of a carrier gas in *Polanyi* et al would not have been obvious as discussed by the examiner." Final Office Action dated March 29, 2005, page 3, last third of page. The Appellants assert, as is discussed above, that the Polanyi reference teaches that the negligible gas-phase dissociation by the irradiation, as required by the Group I claims, was due to the existence of an Ultra High Vacuum (UHV) environment. Polanyi, column 10, lines 28-33. The Appellants assert that it is clear that a carrier gas cannot exist in a UHV environment and therefore a workable combination of these two references cannot exist.

Group III: Claim 9

With Regards to the Group III claim, the Appellants refer to the above remarks concerning the lack of a teaching of the Group I limitation of "passing the carrier gas with the suspended donor compound over the substrate." Because the cited references do not teach or suggest passing a carrier gas "over the substrate," the Appellants assert that there is further no teaching of "a laminar flow over the substrate" as is set forth by the group III claim. The Appellants also point out that the Examiner has not cited a particular portion of the cited references that teach the limitation of the Group III claim.

Group IV: Claim 10

With Regards to the Group IV claim, the Appellants refer to the above remarks concerning the lack of a teaching of the Group I limitation of "passing the carrier gas with the suspended donor compound over the substrate." Because the cited references do not teach or suggest passing a carrier gas "over the substrate," the Appellants assert that there is further no teaching of passing the carrier gas "over the substrate at a rate that causes formation of the film of the donor compound on the substrate so that the film is a few monolayers thick" as is

set forth by the group IV claim. The Appellants also point out that the Examiner has not cited a particular portion of the cited references that teach the limitation of the Group IV claim.

Group V: Claim 15

With Regards to the Group V claim, the Appellants point out that although the Examiner includes claims 15-19 as rejected in the "Office Action Summary" of the final office action dated March 29, 2005, the Examiner does not discuss the rejection of claims 15-19 anywhere else in the final office action. The Examiner does not state any grounds of rejection for claims 15-19, or cite any references that teach the limitations of claims 15-19. The Examiner has therefore also not cited a particular portion of the cited references that teaches the limitation of the Group V claim of "wherein the intensity is sufficient to initiate decomposition of the donor compound by a nonlinear two photon absorption process." The Appellants assert that the cited prior art references do not discuss photon absorption process of their deposition and therefore cannot teach or suggest the limitation of the Group V claim.

Group VI: Claim 16

As discussed above with Regards to the Group V claim, the final office action dated March 29, 2005, does not provide any description of the rejection of claims 15-19, which include the Group VI claim. The Examiner has therefore also not cited a particular portion of the cited references that teaches the limitation of the Group VI claim of "wherein the optical radiation has a peak intensity of at least about 50 Gigawatts per square centimeter." The Appellants assert that the cited prior art references do not teach or suggest the limitation of the Group VI claim when taken either alone or in any combination with one another.

Group VII: Claims 17 and 20

The Appellants suggest selection of claim 20 as representative of the Group VII claims. With regards to the Group VII claims, the Appellants point out

that the Examiner does not specifically discuss the rejection of claims the Group VII claims in the final office action and has not cited any particular portion of the cited references that teach the limitation of the Group VII claims of

> flowing a carrier gas in contact with a solid donor compound to generate a mixture of donor compound vapor and carrier gas; and
>
> flowing the mixture over the substrate.

The Appellants assert that the cited prior art references do not teach or suggest the above limitations of the Group VII claims.

B. WHETHER CLAIMS 23-25 ARE UNPATENTABLE OVER *POLANYI ET AL* IN VIEW OF *MORISHIGE* IN FURTHER VIEW OF *TRUSHIN ET AL.*

In the Final Office Action of March 29, 2005, the Examiner rejected claims 23-25 under 35 U.S.C. § 103(a) as being unpatentable over *Polanyi et al.* (U. S. Patent No. 6,319,566) (Hereinafter *Polanyi*) in view of *Morishige* (U. S. Patent No. 4,711,790) (Hereinafter *Morishige*) in further view of *Trushin et al* (Femtosecond Dynamics...) (Hereinafter *Trushin*). The Appellants respectfully submit that claims 23-25 are not unpatentable over *Polanyi* in view of *Morishige* in further view of *Trushin* under 35 U.S.C. § 103(a). The Appellants respectfully assert that the *Polanyi, Morishige,* and *Trushin* references, taken either alone or in any combination with one another, does not teach or suggest the claimed limitations of: "wherein the optical radiation has a pulse width that does not cause thermal absorption by the element so as to prevent thermally induced breakdown of the donor compound."

Group II: Claims 23-25

The Appellants suggest selection of independent claim 23 as representative of the Group II claims.

The *Trushin* et al. reference describes experimental processes using single-photon UV decomposition of metal carbonyl molecules that are in a gas phase in order to discover and characterize the photochemical process by which metal carbonyl molecules are decomposed. See *Trushin* at abstract. *Trushin* uses short duration laser pulses to better observe the chemical mechanics that cause the observed reactions. See, e.g., *Trushin* at 4130 (left column, first full paragraph).

Additionally, none of *Polanyi*, *Morishige* or *Trushin*, taken either alone or in combination with each other, teaches or suggests the following recited elements of claim 21.

> providing a donor compound suspended in a carrier gas, the donor compound including the element for deposition;
>
> passing the carrier gas with the donor compound over the substrate so as to form a film of the donor compound on the substrate; and
>
> irradiating the donor compound with optical radiation so as to cause deposition of the element onto the substrate through photochemical decomposition of molecules of the donor compound within the film on the substrate,
>
> wherein the optical radiation has a pulse width that does not cause thermal absorption by the element so as to prevent thermally induced breakdown of the donor compound.

As discussed above with regards to the Group I claims, *Polanyi* and *Morishige* do not teach or suggest the recited limitations of providing a donor compound, including the element for deposition, suspended in a carrier gas, and passing the carrier gas with the donor compound over the substrate so as to form a film of the donor compound on the substrate. *Trushin* also fails to teach or suggest these recited features.

Further, there is no mention in these references, or even a citation by the Examiner of a teaching by these references of the following recited feature.

> wherein the optical radiation has <u>a pulse width that is insufficient to cause thermal absorption by the element so as to prevent thermally induced breakdown of the donor compound</u>.

The Examiner asserts that "Polanyi et al. teaches the irradiation process is a femtoscale process." Final Office Action dated July 29, 2004, page 5, third paragraph. However, this mis-characterizes the cited portion of *Polanyi*. The *Polanyi* reference only discusses the time-scale of the dissociation reaction, not the irradiation process as asserted by the Examiner. *Polanyi*, in fact, is describing an exchange reaction wherein dissociated Cl (chlorine) is never present as a free atom, but is part of an exchange reaction. *Polanyi* at column 13, lines 21-26. The time-scale of such chemical reactions is well known, and neither *Polanyi* nor any other cited reference ever discusses or suggests using such short time periods as an irradiation time for a deposition process. The use of such short irradiation times is counter to the intent of causing appreciable deposition of material onto the substrate. In contrast to what is asserted by the Examiner, *Polanyi* actually states that its process uses laser pulse widths from nanoseconds (10^{-9} s) to picoseconds (10^{-12} s). *Polanyi* at column 4, lines 45-47. This certainly does not provide any motivation to use a shorter pulse, and even teaches away from using shorter pulses, such as the femtosecond (10^{-15} s) pulses recited in dependent claims 24 and 25 of the Group II claims. In any event, the cited references do not teach or suggest selection of a pulse width that "is insufficient to cause thermal absorption by the element so as to prevent thermally induced breakdown of the donor compound."

The Appellants further assert that application of the teachings of Trushin, which is an experimental system, is not consistent with the teachings of the other cited references, nor the purposes of the present invention, which are directed to the disposition of appreciable amounts of material in order to create sizable deposits for practical use in semiconductor fabrication, creation or repair of semiconductor lithography masks, and the like. Specification, page 1, lines 13-15. Neither *Trushin* nor any other cited reference provides a motivation for using short duration laser pulses for deposition of appreciable quantities of material by a photolytic process.

Further, the adaptation of *Trushin*, which is an <u>experimental apparatus</u> used to observe molecular behavior, so as to create the system of the present

invention destroys the intent, purpose and function of the *Trushin* reference. The Federal Circuit has consistently held that when a §103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, such as proposed modification is not proper and the prima facie case of obviousness can not be properly made. See *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

IX. CONCLUSION

For the reasons stated above, Appellants respectfully contend that each claim is patentable. Therefore, reversal of all rejections is courteously solicited.

Respectfully submitted,

Dated: September 6, 2005

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IX. APPENDIX

1. A method of depositing one or more elements on a substrate, the method comprising the steps of:

providing a donor compound suspended in a carrier gas, the donor compound including the one or more elements for deposition;

passing the carrier gas with the suspended donor compound over the substrate so as to form a film of the donor compound on the substrate; and

irradiating the donor compound with optical radiation having an intensity sufficient to cause deposition of the one or more elements onto the substrate through photochemical decomposition of molecules of the donor compound within the film formed on the substrate,

wherein the intensity of the optical radiation is insufficient to cause significant photolytic breakdown of molecules of the donor compound that are suspended in the carrier gas.

2. The method of claim 1, wherein the step of providing a donor compound comprises the sub-step of providing the donor compound at a temperature substantially equal to an average temperature of the substrate.

3. The method of claim 1, wherein the film formed on the substrate is less than 50 monolayers thick.

4. The method of claim 1, wherein the film formed on the substrate is less than 5 monolayers thick.

5. The method of claim 1, wherein the donor compound comprises of chromium hexacarbonyl.

6. The method of claim 1, wherein the donor compound consists essentially of chromium hexacarbonyl.

7. The method of claim 1, wherein the donor compound comprises dimethylgold-trifluoro acetylacetonate.

8. The method of claim 1, wherein the optical radiation has a wavelength greater than 350 nanometers.

9. The method of claim 1, wherein in the passing step, the carrier gas is passed over the substrate at a rate that causes it to have a laminar flow over the substrate.

10. The method of claim 1, wherein in the passing step, the carrier gas is passed over the substrate at a rate that causes formation of the film of the donor compound on the substrate so that the film is a few monolayers thick.

11. The method of claim 1, wherein the optical radiation has a peak intensity of at least about 5 Gigawatts per square centimeter.

12. The method of claim 1, wherein the step of irradiating includes the sub-step of using a laser source to generate radiation with a wavelength of 400 nanometers.

13. The method of claim 1, wherein the optical radiation has a wavelength between 200 and 300 nanometers.

14. The method of claim 1, wherein the step of irradiating is performed for a duration that is not long enough to cause thermally induced decomposition of the donor compound.

15. The method of claim 1, wherein the intensity is sufficient to initiate decomposition of the donor compound by a nonlinear two photon absorption process.

16. The method of claim 1, wherein the optical radiation has a peak intensity of at least about 50 Gigawatts per square centimeter.

17. The method of claim 16, wherein the step of providing a donor compound comprises the sub-steps of:

flowing a carrier gas in contact with a solid donor compound to generate a mixture of donor compound vapor and carrier gas; and

flowing the mixture of over the substrate.

18. The method of claim 16, wherein the donor compound consists essentially of dimethylgold-trifluoro acetylacetonate.

19. The method of claim 16, wherein the donor compound comprises one or more compounds selected from a group consisting of tungsten hexacarbonyl, molybdenum hexacarbonyl, aluminum hexafluoroacetylacetonate, and platinum (ii) hexafluoroacetylacetonate.

20. The method of claim 1, wherein the step of providing a donor compound comprises the sub-steps of:

flowing a carrier gas in contact with a solid donor compound to generate a mixture of donor compound vapor and carrier gas; and

flowing the mixture over the substrate.

21. The method of claim 20, wherein the sub-step of flowing the mixture comprises flowing the mixture over the substrate at a velocity of at least about 5 cm/second.

22. The method of claim 20, wherein the sub-step of flowing the mixture comprises flowing the mixture over the substrate at a velocity of at least about 50 cm/second.

23. A method of depositing at least one element on a substrate, the method comprising the steps of:

providing a donor compound suspended in a carrier gas, the donor compound including the element for deposition;

passing the carrier gas with the donor compound over the substrate so as to form a film of the donor compound on the substrate; and

irradiating the donor compound with optical radiation so as to cause deposition of the element onto the substrate through photochemical decomposition of molecules of the donor compound within the film on the substrate,

wherein the optical radiation has a pulse width that is insufficient to cause thermal absorption by the element so as to prevent thermally induced breakdown of the donor compound.

24. The method according to claim 23, wherein the pulse width has a duration of less than about 125 femtoseconds.

25. The method according to claim 23, wherein the pulse width has a duration of less than 1 picosecond.